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Studies on the analysis of pesticide residues in food (XL) PCB (polychlorinated biphenyls) residues in imported smelt fished from the Canadian Great Lakes

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Studies on the Analysis of Pesticide Residues in Foods (XL) PCB (Polychlorinated Biphenyls) Residues in Imported Smelt fished from the Canadian Great Lakes

Hiroshi SEKITA, Kumiko SASAKI, Yohko KAWAMURA, Mitsuharu TAKEDA and Mitsuru UCHIYAMA

The inspection of PCB (polychlorinated biphenyls) residues in pond smelt samples imported from Canada in June, 1983, fished from Lake Erie, one of the Great Lakes, was performed by gas chromatography with ECD. From the result of the quantification by the method by Kashimotos', PCB residues in 10 smelt samples tested in this inspection ranged from 0.12 to 0.24 ppm (average: 0.166 ppm).

(Received May 31, 1985)

PCBs (polychlorinated biphenyls) are a species of aromatic organic chlorine compound and a typical environment pollutant that is presently spread over wide areas throughout the world[1, 2]. The Japanese Ministry of Health and Welfare is now setting statutory values for PCB residues in several kinds of foods[3].

We performed in June 1983 the analysis of the PCB residues so as to know the degree of PCB contamination in frozen smelt captured commercially in Lake Erie which is bordering on Lake Huron, one of the five great lakes inhabited by fish and shellfish contaminated at the time by Dioxin (polychlorinated dibenzodioxin). The fish was imported frozen. We present hereunder the results of our analysis.

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Experimental

1. Samples

Specimens of frozen smelt for frying taken from Lake Erie in Canada were sent to us from the food Health Department of the Ministry of Health and Welfare (appellation changed in July 1984 to Food Health Protection Department). We received simultaneously other specimens from the Fukuoka Prefectural Health Bureau in mid-June 1983. The total is ten.

2. Reagents and equipment

We used hexane and ethanol solvents as well as water appropriate for tests on residual pesticides[4].

Sodium sulfate anhydride: from Wako Jun'yaku Co., for testing residual pesticides

Florisil: we used after activating for more than 16 h at 130°C a product for the analysis of residual pesticides made by the Floridin Co. and bought from the same aforementioned company.

Unless mentioned otherwise, the other reagents were commercial special-grade reagents.

Homogenizer: Multiblender mill from the Nippon Seiki Seisakusho Co.

Reduced-pressure concentrator: Kuderna-Danish type concentrator from the Maeda Seisakusho Co.

3. Extraction-Purification

p. 126

We extracted and purified by the alkaline degradation method according to the PCB standard testing method[1, 5] designed by the PCB analysis and research team of the Ministry of Health and Welfare.

4. Gas chromatography conditions

Type of equipment: We connected a Chromatopack C-RIA data processor from the Shimadzu Co. to a GC-4BM model (fitted with a ECD) from the same company).

Column: inner diameter: 2.6 mm; length: 1.5 m (made from glass)

Packing: 2% OV-1 (Chromosorb W-HP, 100-120 mesh)

Column temperature: 220°C

Injection port-detector temperature: 270°C

Carrier gas/flow rate: nitrogen/25 mL/min

Sensitivity: 16

Injection volume: 2 μL

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We performed the PCB quantitative analysis by the method of Kashimoto et al (method converting to numeral values)[6].

Results and discussion

We performed in late June 1983 the analysis of residual PCBs, an organic chlorine environmental pollutant spread over wide areas throughout the world with regard to smelt caught in Lake Erie which is adjacent to Lake Huron, one of the five great lakes where at the time contamination by dioxin had become a problem in the US and in Canada. The smelt had been imported frozen from Canada. Our results are shown in Table 1.

The quantity of residual PCB in the imported smelt samples we analyzed was within the 0.12 ~0.24 ppm (average value: 0.166 ppm) range. These numerical values showed a low concentration viz. 10 times

smaller than the regulatory value set for PCB in fish and shellfish by the Ministry of Health and Welfare (3 ppm for fish and shellfish from the inner bays of the inner seas)[3].

We investigated separately the dioxin in the same samples (2, 3, 7, 8 and 1, 3 , 6, 8 tetrachlorodibenzo-p-dioxin) by the GC-MS method but detected no Dioxin.

Table 1. PCB residues in the pond smelt samples imported from Canada fished from Lake Erie one of the Great Lakes in 1983

Sample No.	P C B residues (ppm)
1	0.12
2	0.19
3	0.14
4	0.16
5	0.13
6	0.13
7	0.14
8	0.19
9	0.24
10	0.22
Average	0.166

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2) 千葉幹雄：PCB 汚染とその分析法．（1978）ラティス（丸善）
3) 昭和47年8月24日環食第442号環境衛生局長通知；食衛誌，14，126（1973）
4) 武田明治：農薬科学，2，129（1974）
5) 厚生省環境衛生局 PCB 分析研究班報告書（1972年6月）（昭和44年度科学技術庁特別研究調整促進費による成果報告書）
6) 鵜川昌弘，中村彰夫，樫本　隆：食衛誌，14，415（1973）

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6. Masahiro UGAWA, Akio NAKAMURA, Takashi KASHIMOTO: Shokuhin Eiseigaku Zasshi (Journal of the Food Hygienic Soc. of Japan) 14, 415 (1973).

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*Translator's note: reading not quite certain.